

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5: G09F 19/02, G09G 3/02, 3/20 G09G 3/16, 5/00		A1	(11) International Publication Number: WO 92/18969 (43) International Publication Date: 29 October 1992 (29.10.92)
<p>(21) International Application Number: PCT/US92/03224</p> <p>(22) International Filing Date: 20 April 1992 (20.04.92)</p> <p>(30) Priority data: 687,336 18 April 1991 (18.04.91) US</p> <p>(71) Applicant: TECHNOLOGISTICS, INC. [US/US]; 1385 5th Street South, Naples, FL 33940 (US).</p> <p>(72) Inventors: SIDOTTI, James, E.; 1385 5th Street South, Naples, FL 33940 (US). PRING, Ryan; 26 S. Holman Way, Apt. 3-F, Golden, CO 80401 (US).</p> <p>(74) Agent: STANDLEY, Jeffrey, S.; Porter, Wright, Morris &amp; Arthur, 41 South High Street, Columbus, OH 43215 (US).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CA, CH (European patent), DB (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), LU (European patent), MC (European patent), NL (European patent), SE (European patent).</p> <p>Published With international search report.</p>	
<p>(54) Title: COMPUTERIZED CHANGEABLE SIGN</p> <p>(37) Abstract</p> <p>An improved changeable sign (10) having a plurality of modules (12). Each module (12) is adapted to display a character on a character strip contained within each module (12). A system is disclosed whereby a user may enter a plurality of messages in a data processing terminal (70) to be transmitted to the sign (10). The terminal (70), which may be a personal computer equipped with program means may store a plurality of messages and selectively change the messages on the sign at predetermined times without inter manual involvement.</p>			

## FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT:

AT	Austria	ES	Spain	MG	Madagascar
AU	Australia	FI	Finland	ML	Maldives
BB	Barbados	FR	France	MN	Mongolia
BE	Belgium	GA	Gabon	MR	Mauritania
BF	Burkina Faso	GB	United Kingdom	MW	Malawi
BG	Bulgaria	CN	China	NL	Netherlands
BJ	Benin	CR	Croatia	NO	Norway
BK	Brazil	HU	Hungary	PL	Poland
CA	Canada	IT	Italy	RO	Romania
CF	Central African Republic	JP	Japan	KU	Russian Federation
CG	Chad	KP	Democratic People's Republic of Korea	SD	Sudan
CH	Switzerland	KR	Republic of Korea	SE	Sweden
CI	Costa d'Ivoire	LI	Liechtenstein	SN	Senegal
CM	Cameroon	LK	Sri Lanka	SU	Soviet Union
CS	Czechoslovakia	LU	Luxembourg	TD	Togo
DE	Germany	MC	Monaco	TC	United States of America
DK	Denmark			US	

PCT/US92/03224

WO 92/18969

- 1 -

COMPUTERIZED CHANGEABLE SIGNBACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates generally to a display apparatus, and more particularly, to a new and improved changeable sign having modules that each display a selected character forming part of a message wherein the message may be changed via a computer.

There are various types of display apparatus known today in which characters (usually letters, numbers, and/or punctuation marks) are made visible on the display apparatus to present a desired message. Devices such as these have been in use by a number of different businesses including, restaurants, theaters, consumer retail stores, airports, hotels, hospitals, and various other locations. One of the most important features of these signs is for the public to be able to clearly see the message as it appears on the sign. It is also desirable for the sign to be easy to maintain and for the message to be conveniently changed.

U.S. Patent No. 3,699,564 to Hodge, Jr. et al. for a display apparatus describes a changeable sign having a plurality of modules arranged to display a message. Each module is designed to display a selected character that forms part of the message. Each module includes a strip, preferably of flexible material, on which a series of characters are

PCT/US92/03224

WO 92/18969

- 2 -

provided such that as the strip is wound from one spool to another the characters move successively through a viewing area. The 3,699,564 patent is incorporated by reference herein.

The present invention comprises an apparatus for displaying a message that is relatively simple, reliable, easy to maintain, and provides for clearer, easier to see, characters. The display apparatus may be provided with a light source entirely within each module. Each module may be practically self-sufficient so that if any particular module fails it can be replaced by a working module. Furthermore, the present invention comprises data processing means in association with the modules of the sign to control the message appearing on the sign. The present invention enables messages to be stored in data storage means to later be displayed on the sign. The present invention also provides program means by which stored messages may be displayed on the sign at specified times. At the specified time the sign will change messages automatically without contemporaneous human involvement. The present invention further provides means by which the message on the sign can be changed to a new message without need for the sign to be in sight of a person changing the message. The present invention discloses a system whereby the desired message to be

WO 92/18969

PCT/US92/03224

- 3 -

displayed on the sign is first seen on a data terminal screen. The data terminal may be adapted such that spaces on the terminal screen correspond to modules at the sign.

The present invention provides a unique module design for changeable signs. Each module may be individually provided with illumination means, such as a fluorescent lamp. The light source may be entirely self-contained within each module with only a need for an outside current source. Therefore, in one preferred embodiment there would be as many individual light sources as there are modules in a sign. Furthermore, every module may be separate from other modules, and removable and replaceable by simply disconnecting the module from a power source (such as a power strip with receptacles mounted on a rear panel of the sign frame) and reconnecting a new module. This allows for efficient servicing of a sign. If one module is in need of service, it is simply replaced with another working module. While the broken module is being serviced the sign continues in use. Since each module may be individually lighted by its own lamp, the entire sign is not effected when a lamp goes out. The present invention may be relatively lightweight and easy to install since each module can be connected by hand by simply plugging it in. The sign components may be made from various materials.

PCT/US92/03224

WO 92/18969

- 4 -

preferably lightweight metals, such as aluminum, and/or plastics.

In a preferred embodiment of the present invention a data processing terminal along with a keyboard is connected through control hardware to the modules of the sign. Each module contains means for informing the terminal of which character on the character strip is visible through the character display viewing area of the module. Program means in association with the terminal enable a user to input a message via the keyboard and by the push of a button on the keyboard the message on the sign is changed to the message input at the terminal by the user. Message storage means are provided for storing a plurality of different messages which may be selectively displayed on the sign at a predetermined time. Consecutive predetermined and timely message changes may be accomplished without manual involvement after the messages have been stored in the data storage means and programmed to be activated (i.e. - displayed on the sign) at a future time. The foregoing and other objects and advantages will become more apparent when viewed in light of the accompanying drawings and following detailed description.

WO 92/18969

- 5 -

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view of an embodiment of the present invention whereby a user may enter in a data processing terminal a message to be displayed on the sign;

FIGURE 2 is a perspective arrangement of a changeable sign in communication with a data processing terminal and keyboard, in which a message has been entered in the terminal to be displayed on the sign;

FIGURE 3 is a perspective arrangement in accordance with FIGURE 2 wherein the message entered in the terminal is now displayed on the sign, having replaced the message displayed in FIGURE 2;

FIGURE 4 is a perspective view of a module shown without outer panels, showing the flexible character strip;

FIGURE 5 is a partial view of the character strip showing respective bar codes passing through a sensor (for the purpose of clarity the strip is shown unscrolled and the remaining components of the module are not shown);

FIGURE 6 is a section view taken along line 6-6 in FIGURE 5;

FIGURE 7 is an enlarged partial perspective, partial schematic view of the sensor of FIGURE 6 in association with a power source and a computer;

PCT/US92/03224

WO 92/18969

- 6 -

FIGURE 8 is a diagram showing an example of a four module sign adapted to be changed via a computer;

FIGURE 9 illustrates the steps in a flow chart of one embodiment of a program for use in association with the present invention;

FIGURE 10 is a perspective view of a module of the present invention;

FIGURE 11 is a section view of the module of FIGURE 10, the section being taken along line 11-11 thereof;

FIGURE 12 is a section view of the module of FIGURE 11, the section being taken along line 12-12 thereof;

FIGURE 13 is a perspective view of a sign with some modules removed; and

FIGURE 14 is a rear perspective view of the module of FIGURE 10.

DESCRIPTION OF PREFERRED EMBODIMENT(S)

Referring now to the drawings, and particularly FIGURE 1, there is illustrated a display apparatus 10 which is a changeable sign. The sign 10 is comprised of a plurality of modules 12 arranged in rows and may be bordered by a frame 14. The front of each module as shown in FIGURE 10 has a window 16 through which various characters will be made visible. Each of the modules 12 is preferably

WO 92/18969

PCT/US92/03224

- 7 -

arranged to display one selected character at a time in conjunction with other modules 12 also displaying characters to form a message.

In the embodiment of FIGURE 10, the module 12 is preferably cube shaped which allows for better nesting of a plurality of modules 12 in one sign 10. The module 12 includes a front housing 18 having a top plate 19. Side panels 20, 22 offer structural support and integrity to the inner workings of the module 12. Rear panel 28 completes the cube shape of the module. The front window 16 may be any suitable transparent material such as glass or plexiglass that will not detract from the visibility of the characters displayed in the window 16. In an appropriate application the window 16 may be just an opening, having no material insert. A character 24, in this case, the letter "T" is displayed on a character strip 26 located interiorally of the window 16.

In a preferred embodiment of the present invention, the character strip 26 is predominantly opaque while the characters displayed thereon are preferably either clear (see-through) or white. The character strip 26 preferably is made of mylar and contains all of the letters of the alphabet, at least the numerals from zero through nine, various punctuation marks, and any other commonly used characters for conveying a message. Of course, the

PCT/US92/03224

WO 92/18969

- 8 -

character strip 26 could be custom-made to have any particular character placed thereon including characters from foreign languages.

Referring next to FIGURES 11 and 12, the inner workings of a particular module 12 of the present invention are illustrated. Each module 12, is equipped with its own source of illumination 38, preferably a fluorescent lamp. In this embodiment, the lamp 38 is made by a company named "Lights of America" and the model number for the lamp 38 is FUL 12CW. Equivalent lamps 38 are also provided by the General Electric Company and Phillips. Of course, other light sources could be incorporated and would fall within the scope of the present invention. A reflector 40 may be provided and positioned inside the module 12, with respect to the source of illumination 38 to obtain maximum light efficiency directed at the window 16 of the module 12. The reflector 40 could be made of many different materials. In the embodiment shown in FIGURES 11 and 12, the reflector 40 may be made from a highly reflective material, such as mirrored aluminum or plastic.

The character strip 26 having the characters 24 thereon, may be scrolled around spools 52, 54 to place the desired character 24 directly behind the window 16. To align the character strip 26 in direct view of the window 16, the character strip 26

WO 92/18969

PCT/US92/03224

- 9 -

passes around rollers 42, 44. Gears 46 placed in motion by a motor 50 may be used to scroll the spools 52, 54. One skilled in the art, could derive several different arrangements for actuating the character strip 26 so that a selected character 24 appears behind the window 16 which would fall within the scope of the present invention.

Referring now to FIGURE 2, a vertical row of four modules 12 is illustrated. The modules 12 may be supported within the sign 10 structure through several different means known to those of skill in the art. For example, a wire may be passed through support means, such as a post 36, into the frame 14. FIGURE 13 illustrates an embodiment in which the modules 12 are simply plugged into electrical power strips 60. The power strips 60 may be secured to a back panel 66 on the sign 10. The action of plugging in a module 12 may be sufficient to physically support the module 12 and prevent it from falling out of the sign 10. Other module 12 retaining means would be apparent to one of skill in the art. The male connector 29 of each module 12 as shown in FIGURE 14, may be plugged into any one of several female connectors 31 embodied in the power strips 60. The power to the motor 50, lamp 38, and sensors 84 may be obtained via connector 29 and inner module wiring.

Referring again to FIGURE 1, a typical

PCT/US92/03224

WO 92/18969

- 10 -

arrangement is shown wherein a sign is located outside of a building for displaying messages to passersby. As will hereinafter be explained, the user 32 shown in FIGURE 1 may input a message into a data processing terminal 70 which can then be transmitted to the sign 10, causing the sign 10 to change to display the message input into the terminal 70. As shown in FIGURE 2, the terminal screen 72 may be formatted to indicate the desired message in a correlative fashion with the modules 12 of the sign 10. In FIGURE 2 the sign 10 has a particular message shown and a new message has been input through the keyboard 74 to the terminal 70 and is shown on the terminal screen 72. As shown in FIGURE 3, the user has activated the message from the terminal screen 72 causing the sign 10 to change messages. When the sign change has occurred, the message on the sign 10 will agree with the message on the terminal screen 72. The changing of a message via the terminal 70 may be accomplished in several ways known to those of skill in the computer art, for example, by striking a particular key on the keyboard 74. Also, the data processing terminal 70 may be programmed to store messages and cause the sign 10 to change at predetermined times as will be explained in greater detail hereinafter.

In order to enable a data processing terminal 70, such as a personal computer, to activate a changing

WO 92/18969

PCT/US92/03224

- 11 -

of the message shown on the sign the individual modules 12 of the sign 10 must be in communication with the terminal 70. The terminal 70 needs to know what character 24 is visible in the window 16 of each module 12 of the sign 10. With this knowledge, the terminal 70 can then instruct the character strip 26 of each module 12 to stop scrolling at a particular character 24 which is visible in the window 16. A preferred method of accomplishing this is shown in FIGURE 4. In FIGURE 4 the outer panels of a module 12 have been removed and the character strip 26 is shown scrolled around rollers 42, 44. Characters 24 such as letters each have an identifying bar code 80 preferably at the lower portion 82 of the strip 26 which passes through a sensor 84. The sensor 84 is capable of reading the bar code 80 and informing the terminal 70 of which character 24 is in view of the module window 16. The bar code 80 for each character 24 is unique. As shown in FIGURE 5, the bar code 80 for the letter "D" is shown passing through the sensor 84. In a preferred embodiment, each bar code 80 is offset to the lower left of each character 24 so that the sensor 84 reading each bar code 80 will not interfere with the view of a character 24 through the window 16 of each module 12. Referring again to FIGURE 4, the letter "E" is shown in the window 16 portion of the module 12 and the sensor 84 is shown

PCT/US92/03224

WO 92/18969

- 12 -

to the lower left scanning the bar code 80 for the letter "E", out of the way of the window 16.

In FIGURE 6 the character strip 26 is shown in cross section passing through the sensor 84. The sensor 84 may function in much the same way as a bar code scanner commonly used today in grocery store check-out lines. The sensor 84 may transmit an infrared beam 85 which is received through an opposite lens 86. The bar codes 80 are comprised of unique arrangements of black vertical bars 88 having white or clear spaces 87 between the black bars 88. As each black bar 88 crosses the optical line of sight between the infrared beam 85 and the opposite lens 86 it causes a break in the beam of light. A commercially available sensor 84 used in one working embodiment of the present invention was supplied by Optek of Carrollton, Texas, Model No. OPB-829C. It should be appreciated that various other sensors/scanners could be used successfully and would fall within the scope of the present invention.

As shown in FIGURE 7, each sensor 84 has a power source 90 and is also connected to the computer 92. Preferably every module 12 will contain at least one sensor 84 and every module 12 will be in communication with the computer 92.

Referring now to FIGURE 8, an electrical wiring diagram is shown for a four module sign connected to a computer 92. The control hardware shown in FIGURE

WO 92/18969

PCT/US92/03224

- 13 -

8 is indicative of a working arrangement which could be incorporated into a sign having many more modules 12.

FIGURE 9 illustrates a flow diagram that explains the various steps the computer program considers as it changes the message on the sign 10. The ONE STEP ENTRY MODE 100 is the first screen the user sees. This menu allows the user to see exactly what is on the sign 10 and change it by typing a message into the computer 92 via the keyboard 74. After the user is finished typing a message and informing the computer 92 (by striking a particular key on the keyboard 74) that the message is complete, the sign changes. The PROGRAM MODE 102 is very similar to that of a VCR, except that instead of recording a particular channel, the sign 10 changes to a particular message. The user can enter a time in which to change the sign 10 (via the ENTER TIME ENTRY 106 menu) and the message in which to change the sign. The messages are entered via a built-in editor (see MESSAGE EDITOR 104). The user may also elect to view the TIME ENTRIES 108, allowing him to view the information he has already entered. While in the PROGRAM MODE 102 main menu, the computer 92 is constantly reviewing the TIME ENTRIES 108 and comparing them to the present time. If the computer 92 detects that it is time to change the sign, the

PCT/US92/03224

WO 92/18969

- 14 -

computer 92 runs through the algorithms outlined in CHANGE SIGN 114.

The ENTER MESSAGE TO DISPLAY 110 is the editor for the ONE STEP ENTRY MODE 100. Whatever is typed into the computer 92 is displayed on the sign through CHANGE SIGN 114. The MESSAGE EDITOR 104 allows a plurality of messages to be entered and stored on disk, floppy or hard disk. These messages are the actual copy that can be displayed on the sign 10. The MESSAGE EDITOR 104 is a simple word processor used to enter messages that are restricted to the dimensions of the sign 10.

The ENTER TIME ENTRY 106 is the actual time programming menu. It is set up like a VCR accepting when to change the message, and what message to display on the sign. Valid TIME ENTRIES 106 can accept specific dates (i.e. May 3, at 10:00 A.M.) or weekly entries (i.e. every Sunday at 9:00 A.M.). The sign may also be programmed to continuously cycle through a set of predefined messages. The VIEW TIME ENTRIES 108 is a convenient way for the user to view the TIME ENTRIES 106 and the messages to be displayed. The step of TIME EQUAL TIME ENTRY? 112 is encountered while in the main menu of the PROGRAM MODE 102. The computer 92 scans through the list of TIME ENTRIES 108 and if the current time is the same as the time entry, the computer changes the

WO 92/18969

PCT/US92/03224

- 15 -

sign to the message associated to that time entry as defined in the ENTER TIME ENTRY 106 step.

When the computer 92 is ready to change the sign, the CHANGE SIGN 114 step is encountered. It uses the message currently displayed to figure out how to display the new message. The first step in changing a sign is the MAKE CHANGE TABLE 116 step. The computer 92 uses the current message and the new message (message to change to) to figure out how to change the sign 10. The message is first broken into individual characters, where each module and the sign holds one character. The characters 24 on the scrolls in each module 12 of the sign are not necessarily in order, therefore, the computer 92 must figure out where each new character 24 to be displayed is located on the scroll 26. The computer 92 knows the order of the characters 24, and therefore, can determine how many characters 24 each module 12 must scroll to get to the new character. The CHANGE TABLE 116 is then created, containing information for each module 12. Each module 12 entry in the CHANGE TABLE 116 contains the number of characters 24 to scroll, the direction in which to scroll, and the character to stop at. Because the number of characters 24 to scroll is computed and read differently than the character identification codes, this provides redundant information that may

PCT/US92/03224

WO 92/18969

- 16 -

be used for error correction in the event of module bar code 80 errors.

The second step before the sign is changed to a new message is to figure out the fastest way to change the sign. This step known as the MAKE PRIORITY TABLE 118 computes a PRIORITY TABLE using the knowledge of how far each module strip 26 must scroll before the correct character 24 is displayed. By changing the modules 12 that need to travel the furthest first, substantial time may be saved in changing the whole sign 10. The result is a PRIORITY TABLE that indicates which module 12 should be changed first. This table may be used to improve reliability, save power, and reduce overall costs, since the sign may not change all modules 12 at the same time.

In the step of START TOP PRIORITY MOTORS 120 the modules 12 to change first are turned on, scrolling the correct direction for the new message. In the step of READ PRIORITY SENSORS 122 the sensors 84 are turned on along with the motors 50. The computer 92 then samples these sensors 84, reading their data as they are reading the bar codes 80 on the scrolls 26. The CHANGE TABLE is constantly adjusted as the scrolls are moving, keeping track of where each module 12 is on the scroll. Bar codes 80 are interpreted as the data stream from the sensors 84 is analyzed. In the step of AT CORRECT CHARACTER?

WO 92/18969

PCT/US92/03224

- 17 -

124 the computer scans through the module sensors 84, computing bar codes 80 and scroll locations. If either the scroll location or the bar code 80 equals that modules 12 entry in the CHANGE TABLE, the motor 50 is turned off, and that modules entry in the PRIORITY TABLE 118 is removed. The PRIORITY TABLE 118 is then scanned for the next highest module 12 priority and that module is then started. In the step of STOP MOTOR 126 each module's motor 50 is stopped after that module is displaying the correct character. In the step of LAST MOTOR? 128 if the PRIORITY TABLE 118 is empty, then the sign is finished changing and the program RETURNS TO MAIN MODE MENU 130.

In reading the bar codes 80, every module 12 contains one infrared transmitter/receiver. The transmitter in this example emits 935nm wavelength light. The sensor 84 receives this light if the path from the emitter 83 is not blocked by an infrared opaque object (such as ink on the silk screened scroll). The sensor 84 alters a current flow through the device depending upon the amount of light it receives. This current is converted into a voltage that is used by the computer 92 to detect if the sensor can "see" through the scroll 26 at the scroll's current location. By sampling the sensor 84 thousands of times per second, while the scroll is moving (motor on), a pattern can be read

PCT/US92/03224

WO 92/18969

- 18 -

consisting of on and off pulses (or opaque and clear). These patterns can then be identified by the computer 92 if the computer knows the motor speed of the scroll. The motor 50 speed can be determined by correctly spacing the bar codes 80 on the scroll when the scroll is made. The bar codes on the scrolls are very much like UPC symbols. Each character on the scroll has a unique code, and therefore the computer 92 can determine one character from the next. In a preferred embodiment, the sensors send data to the computer only. This data is in a bit serial stream read only by the computer. The computer does not send any data to the sensor, except to turn it on or off. The computer directly controls each modules motor. The motor has three possible modes: on-right, on-left, and off. No data is sent from the motor to the computer.

The computer may communicate to the control hardware through a multi-conductor cable. The control hardware then interprets the computers commands and turns motors or sensors on and off.

It is thought that the improved changeable sign of the present invention and many of its attendant advantages will be understood from the foregoing description. It will be apparent that various changes may be made in the form and construction of the components thereof without departing from the

WO 92/18969

PCT/US92/03224

- 19 -

spirit and scope of the invention or sacrificing all of its material advantages. The embodiments hereinbefore described are merely preferred or exemplary forms of the present invention.

PCT/US92/03224

WO 92/18969

- 20 -

WHAT IS CLAIMED IS:

1. A changeable sign system, comprising:  
a sign including a plurality of modules, each  
module including a strip having characters visible  
thereon, said strip adapted to be scrolled by motor  
actuation means such that a selected one of said  
characters appears in a window of each of said  
modules and when viewed in combination with other of  
said modules having characters in view, a message  
may be presented on said sign;

identification means associated with each of said  
characters on said strip for indicating to the  
system which one of said characters is in view  
through said window;

sensor means within each module for recognizing  
said identification means, said sensor means in  
communication with a computer; and

a program in association with said computer for  
interpreting said communication from said sensor  
means in each of said modules, thereby learning  
which one of said characters is in view through said  
window in each of said modules, said computer also  
in communication with said motor actuation means to  
cause said motor actuation means to scroll said  
strip and stop said strip at a desired one of said  
characters.

WO 92/18969

PCT/US92/03224

- 21 -

2. The changeable sign system of Claim 1, wherein said identification means is a series of unique bar codes placed on said strip and adjacent each of said characters.

3. The changeable sign system of Claim 2, wherein said sensor means is at least one infrared transmitter/receiver sensor secured within each of said modules and positioned to accommodate said strip having said bar codes thereon, said strip to pass through said sensor so that said bar codes intersect an optical light line of transmission from said sensor.

4. The changeable sign system of Claim 1, wherein said computer is a personal computer having a terminal screen and a keyboard.

5. The changeable sign system of Claim 1, wherein said strip may be scrolled in a forward direction and a reverse direction.

6. The changeable sign system of Claim 5, wherein said program is capable of determining which direction said strip should scroll to arrive at a selected character with minimal scrolling.

PCT/US92/03224

WO 92/18969

- 22 -

7. The changeable sign system of Claim 1, further comprising: data storage means whereby a plurality of predetermined messages may be stored to later be recalled by said computer to be displayed on said sign.

8. The changeable sign system of Claim 7, wherein said program recalls one of said predetermined messages in said storage means at a designated predetermined time and activates said sign modules to change to said desired message.

9. The changeable sign system of Claim 8, wherein said predetermined time is based on hours.

10. The changeable sign system of Claim 8, wherein said predetermined time is based on hours and date of month.

11. The changeable sign system of Claim 4, wherein rows of modules on said sign correlate with spaces and rows on said terminal screen.

12. A computer program for use in changing a message on a sign, said sign comprising a plurality of modules each of which include a strip having characters thereon, one of said characters to be visible through a window in each of said modules.

WO 92/18969

PCT/US92/03224

- 23 -

said strip further comprising identification means associated with each of said modules including sensor means in combination with said identification means for establishing the identity of the character visible through each window at any given time, said program comprising:

means for storing a plurality of messages;

means for recalling a predetermined message from said storage means at a predetermined time;

means in communication with said sensor means for learning which of said characters is currently visible through said window of each of said modules; and

means for initiating actuation of said strip to cause a desired character to appear through said window of each of said modules.

13. A changeable sign, comprising:

a plurality of replaceable modules;

a window in a front portion of said modules;

means for displaying characters in said windows, said means for displaying characters contained within said modules;

means for illuminating said characters, said means for illuminating located entirely inside each

PCT/US92/03224

WO 92/18969

- 24 -

of said modules and independent of any illumination  
of other of said modules; and  
means for supporting said modules within  
said sign.

WO 92/18969

PCT/US92/03224

1 / 8

Fig. 1

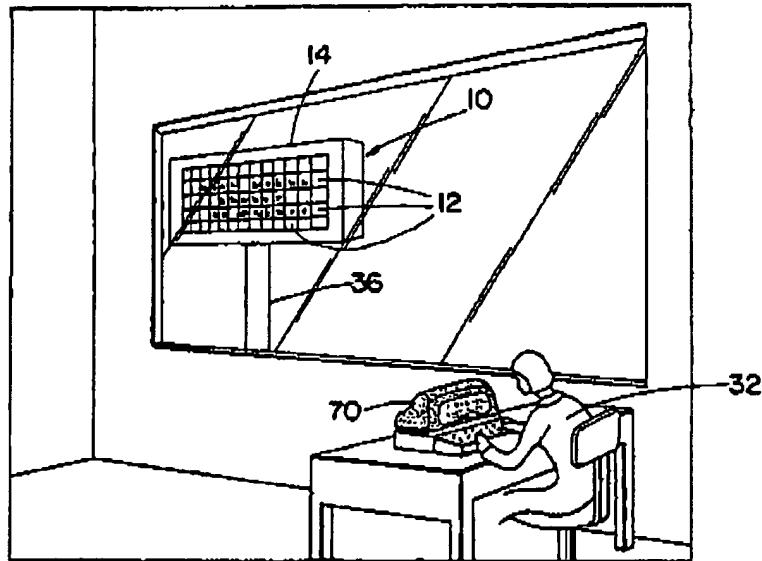
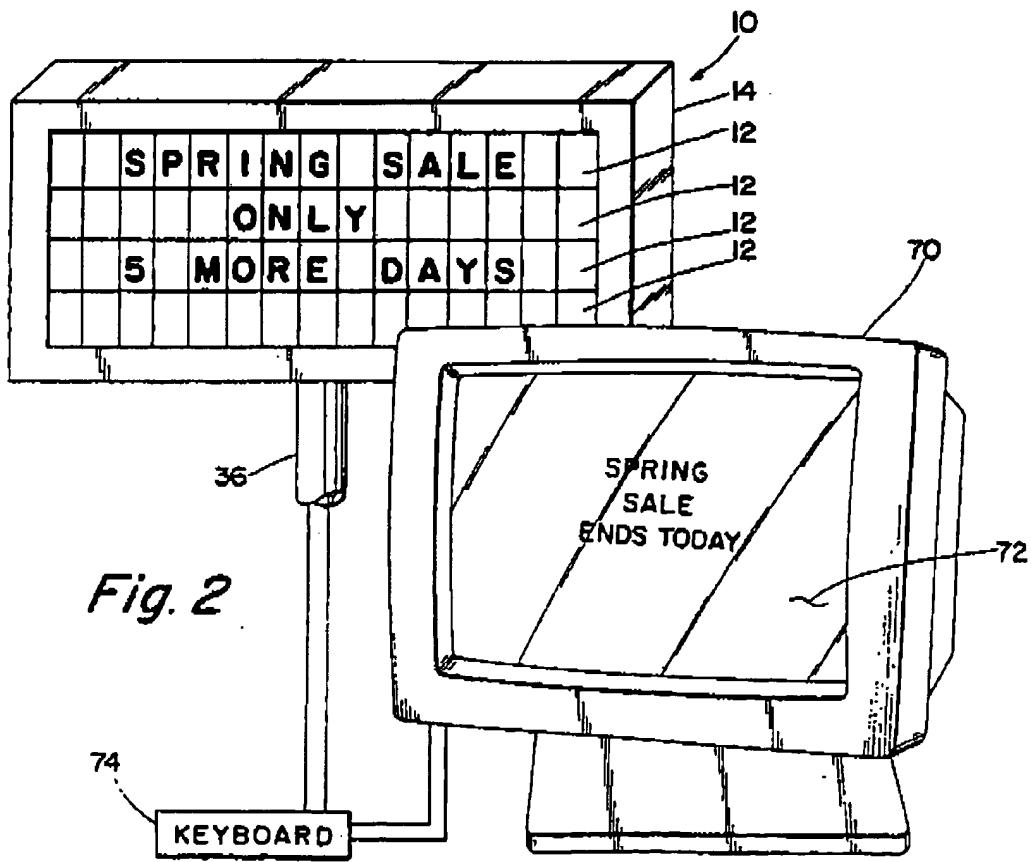


Fig. 2



SUBSTITUTE SHEET

WO 92/18969

PCT/US92/03224

2 / 8

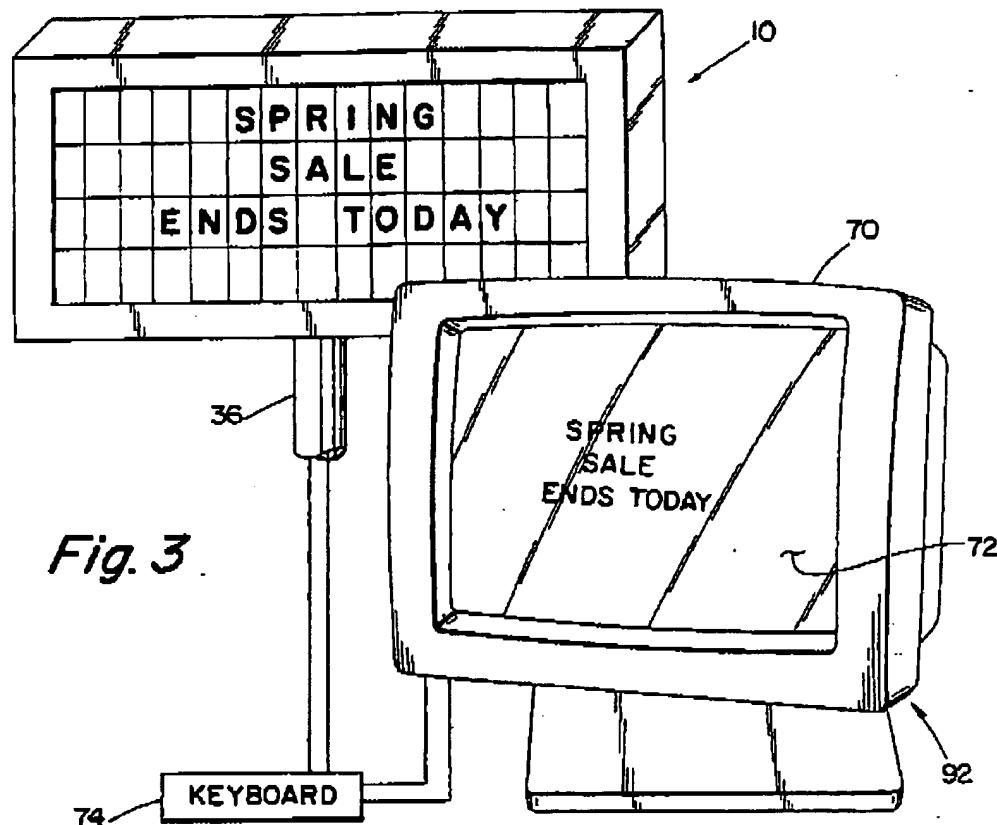


Fig. 3.

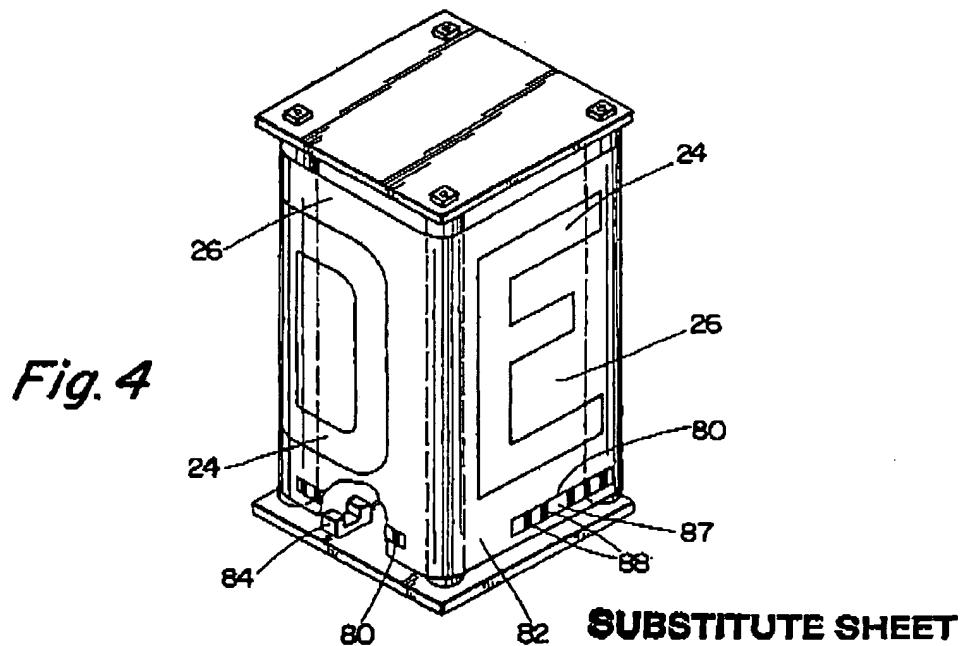


Fig. 4

WO 92/18969

PCT/US92/03224

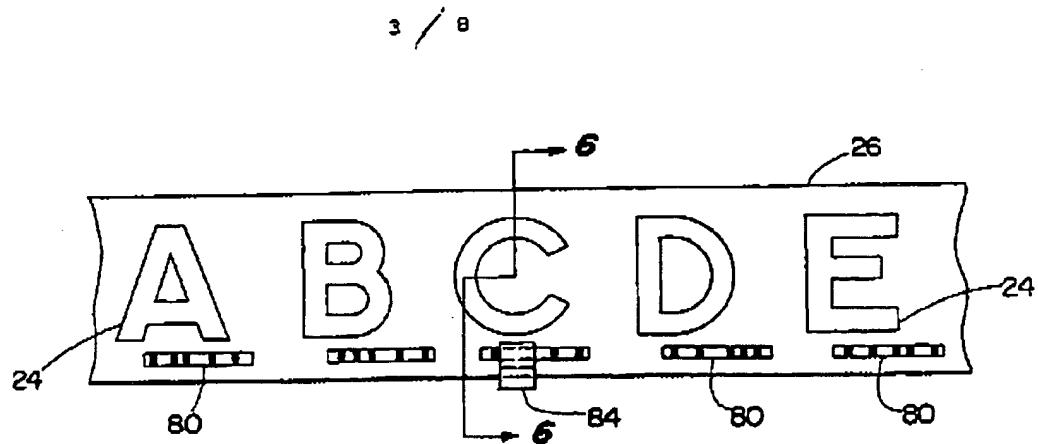


Fig. 5

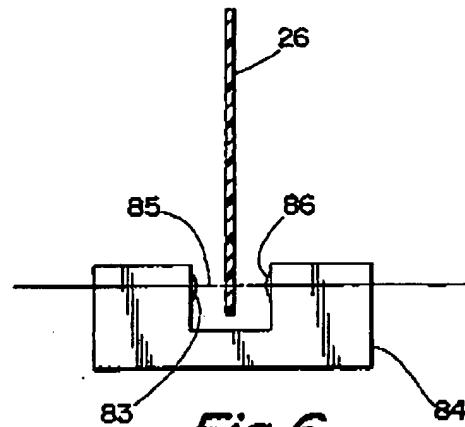


Fig. 6

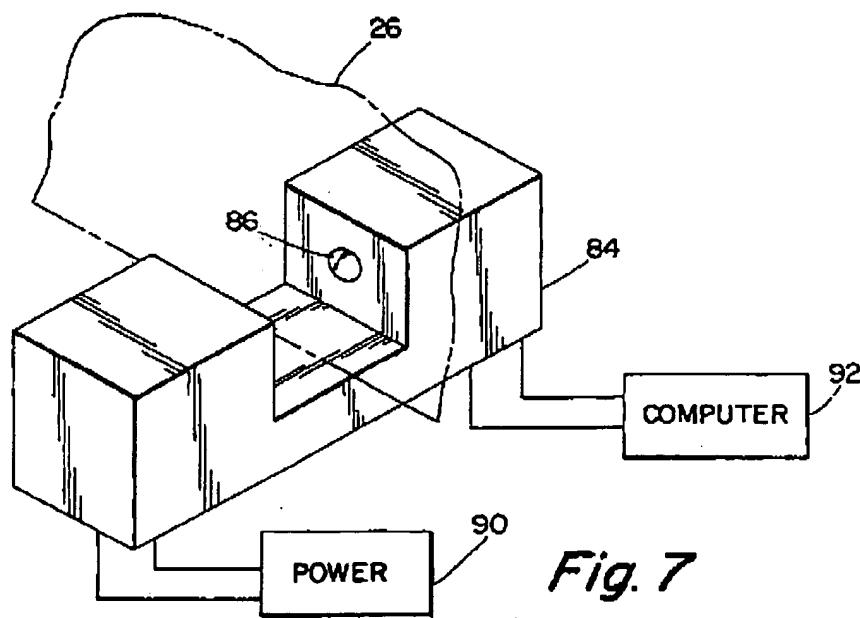


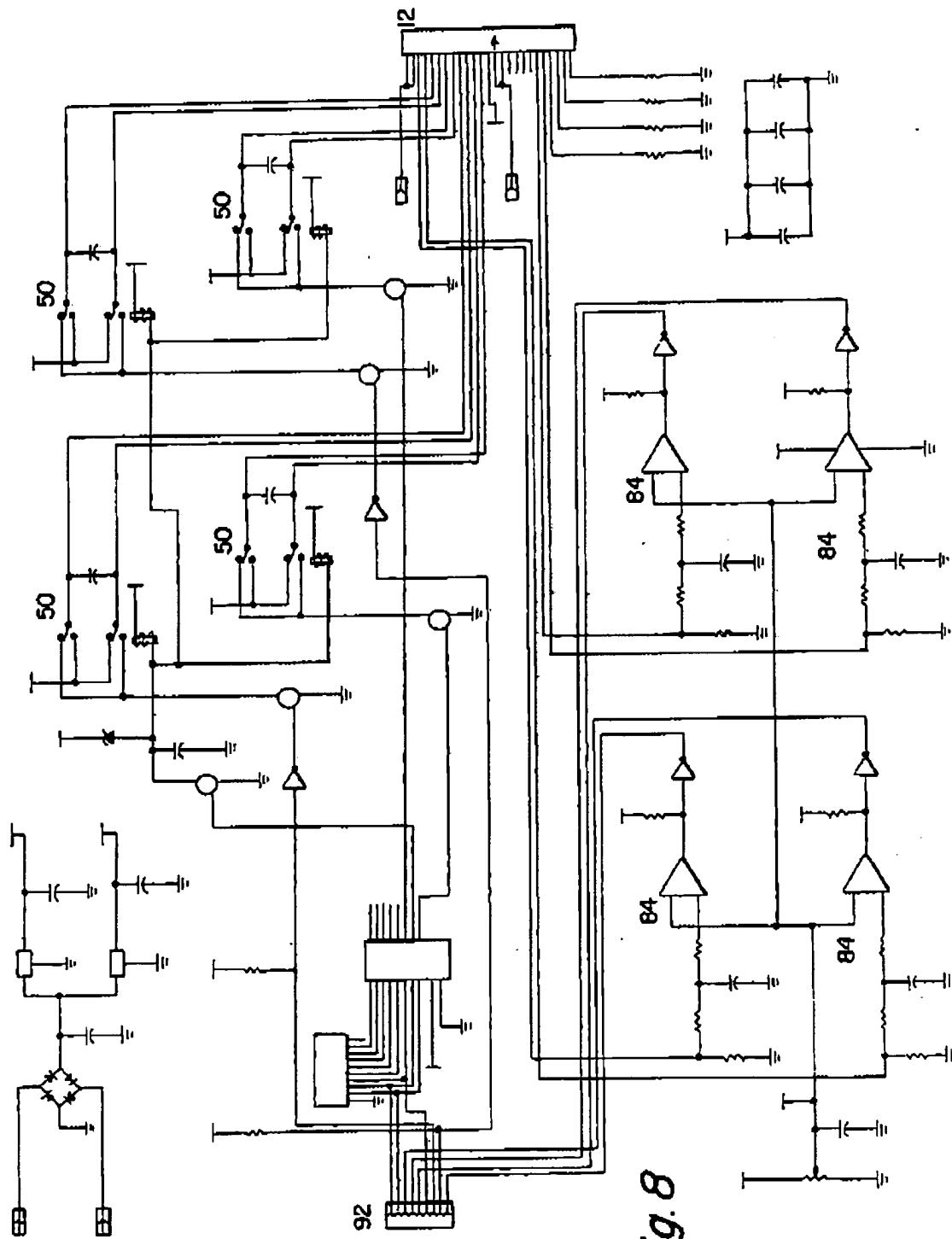
Fig. 7

SUBSTITUTE SHEET

WO 92/18969

PCT/US92/03224

4 / 8

**SUBSTITUTE SHEET**

WO 92/18969

PCT/US92/03224

5 / 8

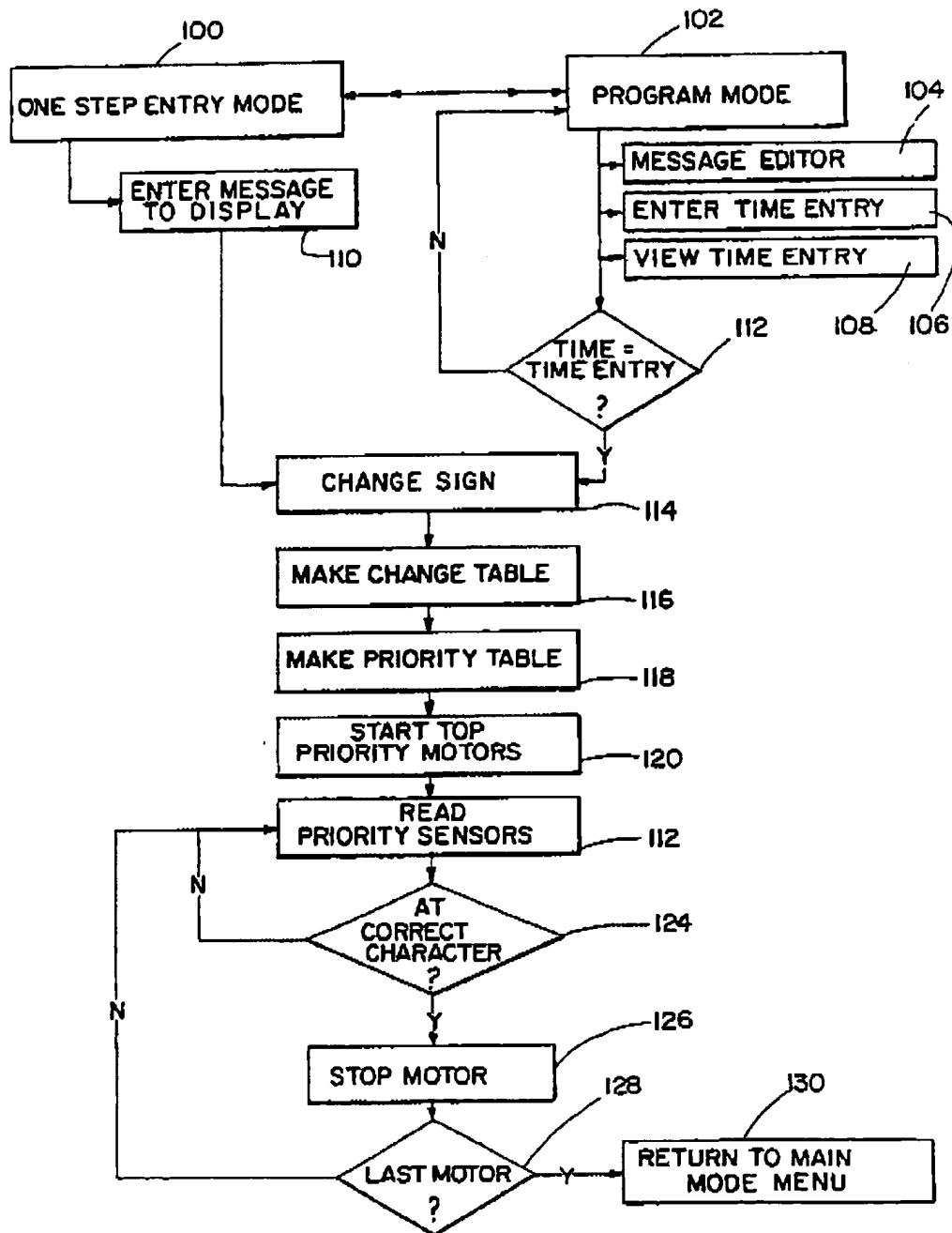


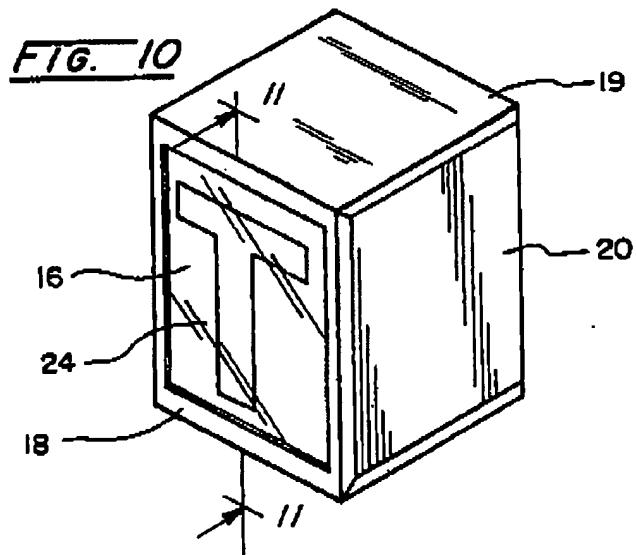
Fig. 9

## SUBSTITUTE SHEET

PCT/US92/03224

WO 92/18969

6/8

**SUBSTITUTE SHEET**

PCT/US92/03224

WO 92/18969

7/8

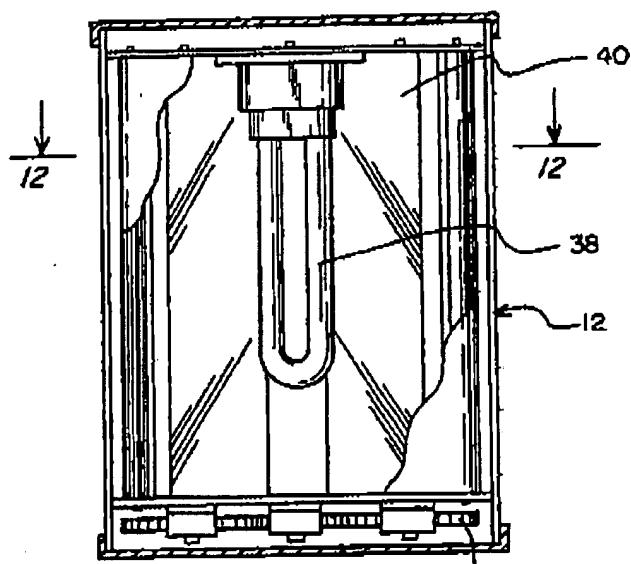


FIG. 11

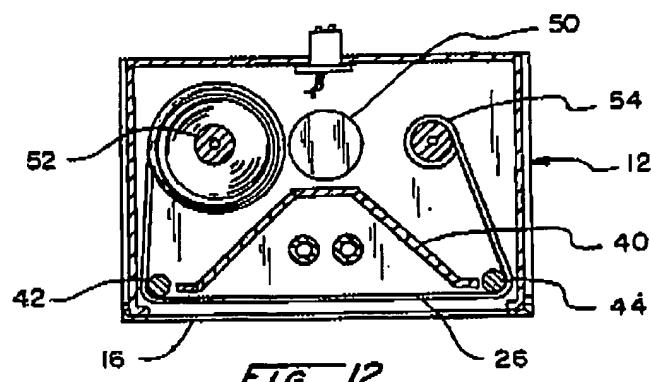


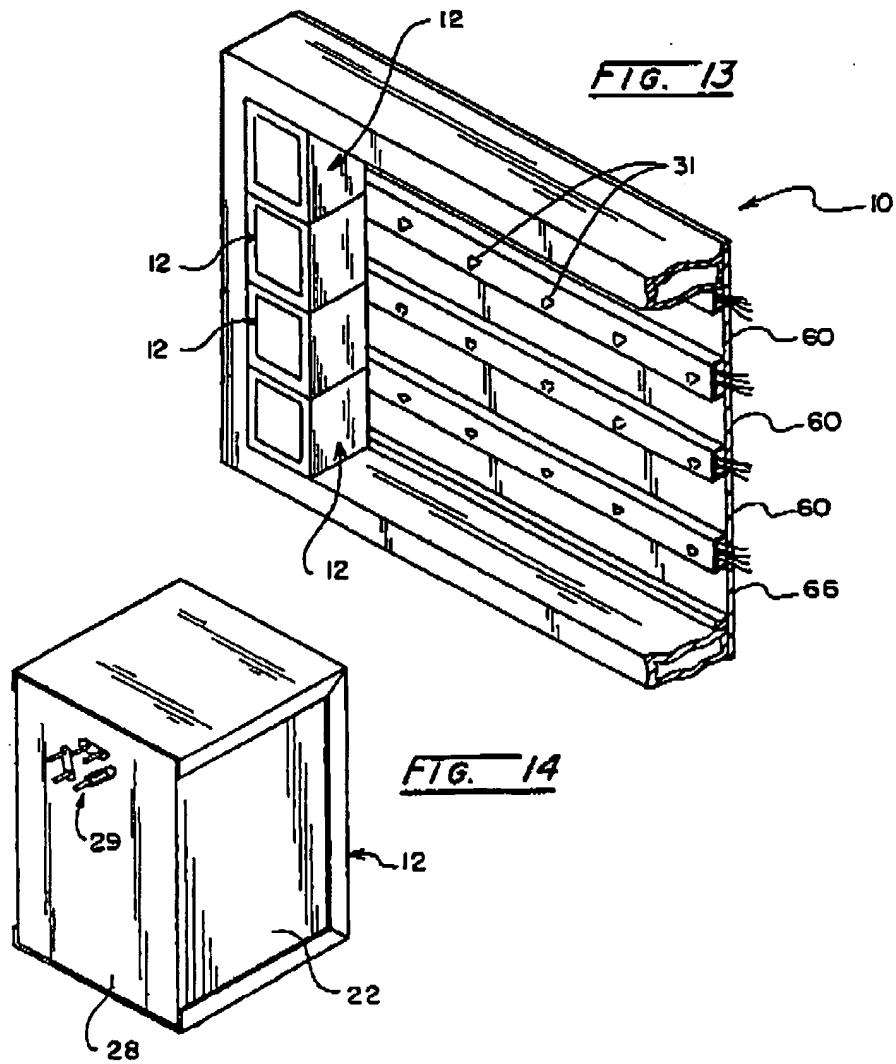
FIG. 12

**SUBSTITUTE SHEET**

PCT/US92/03224

WO 92/18969

8/8

**SUBSTITUTE SHEET**

## INTERNATIONAL SEARCH REPORT

In national application No.  
PCT/US92/03224

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :G09F 19/02; G09G 3/02,3/20,3/16,5/00

US CL :40/467,470;340/717,752,756,764,815,08,815,15

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 40/438447,446,466,471,503,510,512,552,611,618,624;340/755,809,810,815,18,815,26

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

USPTO APS- "Character Strip; sign or Billboard; Bar code; Scan or Scanner; Character Recognition; Module(s) or Modular; Strip or roll; class 40; Class 340

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 5,003,717 (TRAME ET AL.) 02 April 1991, See column 6, line 49 to column 7, line 52.	1,2,5,13 3,6
X	US, A, 4,286,263 (LINDBERG) 25 August 1981, See column 4, line 47 to column 5, line 12.	4,7-12
A	US, A, 3,699,564 (HODGE, JR. ET AL.) 17 October 1972, See column 3, lines 21 to 44 and lines 63 to 68.	1,2,5,13
A,P	US, A, 5,061,921 (LESKO ET AL.) 29 October 1991, See column 1, lines 56 to 48 and column 4, lines 57-68.	1,2,4,7,8, 12,13

<input type="checkbox"/>	Further documents are listed in the continuation of Box C.	<input type="checkbox"/>	See patent family annex.
"	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be part of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"B"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"A"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
13 JULY 1992	10 AUG 1992
Name and mailing address of the ISA/Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer Mr STEVEN J. SARAS Telephone No. (703) 305-4718
Faximile No. NOT APPLICABLE	NGUYEN NGOC-HO INTERNATIONAL DIVISION

Form PCT/ISA/210 (second sheet)(July 1992)\*